

# CLAIMS:

1. A medical device formed of moisture curable materials, comprising:  
a dilatation balloon formed from a crosslinked polymeric material, the  
crosslinked polymeric material comprising the reaction product of:

- 5 I) at least one polymer; and  
II) at least one hydrolyzable silane having the following general  
structure:



15 where X is a monovalent non-hydrolyzable organic moiety comprising at least  
one functional group W which is reactive with said polymer with the proviso that  
an Si-C bond is present between Si and W, Y is a hydrolyzable group, Z is a  
monovalent hydrocarbon group, and m is an integer from 1 to 3;  
said reaction product having been further reacted with moisture to produce a  
polymeric material crosslinked through --Si--O--Si-- linkages.

2. The device of Claim 1 wherein Y is an alkoxy group having from 1 to 4 carbon  
20 atoms.

3. The device of Claim 1 wherein W is selected from (meth)acrylamido,  
(meth)acryloxy, carboxyl, epoxy, amino, ureido, isocyanato, thiocyanato,  
mercapto, styryl, vinyl, allyl, haloalkyl, acid anhydride, sulfonyl azide, carboxylic  
25 acid esters of aromatic alcohols, and mixtures thereof.

4. The device of Claim 1 wherein X is selected from epoxycyclohexyl,  
glycidoxypropyl, isocyanatopropyl, vinyl, and allyl.

- 30 5. The device of Claim 1 wherein said at least one hydrolyzable silane comprises an  
organofunctional group capable of readily reacting with a primary or secondary

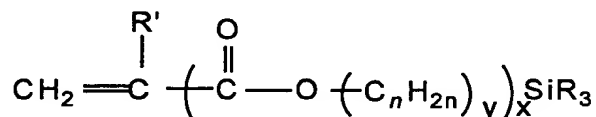
amine and said at least one polymer is an amino functional polymer.

6. The catheter device of Claim 1 wherein said hydrolyzable silane is selected from isocyanatoalkylalkoxysilanes, glycidoxyalkylalkoxysilanes and epoxycylcohexylalkylalkoxysilanes.

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7. The device of Claim 6 wherein said hydrolyzable silane is selected from isocyanatopropyltriethoxysilane, glycidoxypropyltrimethoxysilane and 2-(3,4-epoxycyclohexyl)ethyltrimethoxysilane.

- 10 8. The device of Claim 1 wherein at least one hydrolyzable silane has the following general structure:



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where R' is a hydrogen atom or lower C<sub>1</sub> to C<sub>4</sub> alkyl; x and y are 0 or 1 with the proviso that when x is 1, y is 1; n is an integer from 1 to 12 inclusive, preferably 1 to 4, and each R independently is a hydrolyzable organic group such as an alkoxy group having from 1 to 12 carbon atoms, aryloxy group, aralkoxy group, aliphatic acyloxy group having from 1 to 12 carbon atoms, amino or substituted amino groups, or a lower alkyl group having 1 to 6 carbon atoms inclusive, with the proviso that not more than one of the three R groups is an alkyl.

- 25 9. The device of Claim 8 wherein said reaction proceeds by a free radical mechanism.

10. The device of Claim 9 wherein said free radical initiator is an organic peroxide.

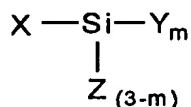
- 30 11. The device of Claim 8 wherein said hydrolyzable silane is selected from vinyltrimethoxysilane, vinyltriethoxysilane, allyltrimethoxysilane,

γ-(meth)acryloxypropyltrimethoxysilane, and mixtures thereof.

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5 A balloon catheter comprising a balloon wherein said balloon comprises a moisture cured polymeric material which is crosslinked through --Si--O--Si-- linkages.

13. The balloon catheter of Claim 12 wherein said moisture cured polymeric material is the reaction product of:

- 10 a) at least one polymer; and  
b) at least one hydrolyzable silane having the following general structure:



15 where X is a monovalent non-hydrolyzable organic moiety comprising at least one functional group W which is reactive with said polymer with the proviso that an Si-C bond is present between Si and W, Y is a hydrolyzable group, Z is a  
20 monovalent hydrocarbon group, and m is an integer from 1 to 3.

14. The balloon catheter of Claim 13 wherein said at least one hydrolyzable silane has an organofunctional group capable of readily reacting with a primary or secondary amine and said at least one polymer is amino functional.

25 15. The catheter balloon of Claim 13 wherein Y is an alkoxy of C<sub>1</sub> to C<sub>4</sub>.

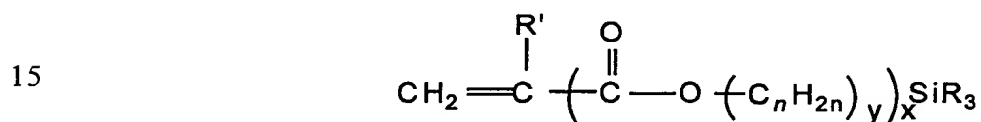
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16. The catheter balloon of Claim 13 wherein W is selected from (meth)acrylamido, (meth)acryloxy, carboxyl, epoxy, amino, ureido, isocyanato, thiocyanato,  
30 mercapto, styryl, vinyl, allyl, haloalkyl, acid anhydride, sulfonyl azide, carboxylic acid esters of aromatic alcohols, and mixtures thereof.

17. The catheter balloon of Claim 13 wherein X is selected from epoxycyclohexyl, glycidoxypentyl, isocyanatopentyl, vinyl, and allyl.

18. The catheter balloon of Claim 13 wherein said hydrolyzable silane is selected  
5 form isocyanatopentyltriethoxysilane, glycidoxypentyltrimethoxysilane and 2-(3,4-epoxycyclohexyl)ethyltrimethoxysilane.

19. The catheter balloon of Claim 12 wherein said moisture cured polymeric material is the reaction product of:

- 10 a) at least one polymer; and  
b) at least one hydrolyzable silane having the following general structure:



20 where R' is a hydrogen atom or lower C<sub>1</sub> to C<sub>4</sub> alkyl; x and y are 0 or 1 with the proviso that when x is 1, y is 1; n is an integer from 1 to 12 inclusive, preferably 1 to 4, and each R independently is a hydrolyzable organic group such as an alkoxy group having from 1 to 12 carbon atoms (e.g. methoxy, ethoxy, butoxy), aryloxy group (e.g. phenoxy), araloxy group (e.g. benzyloxy), aliphatic acyloxy group having from 1 to 12 carbon atoms (e.g. formyloxy, acetyloxy, propanoyloxy), amino or  
25 substituted amino groups (alkylamino, arylamino), or a lower alkyl group having 1 to 6 carbon atoms inclusive, with the proviso that not more than one of the three R groups is an alkyl.

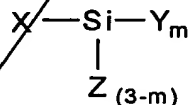
20. A method of forming a catheter balloon comprising the steps of:

- 30 a) providing at least one polymeric material at or above its melt temperature;  
b) providing at least one organofunctional hydrolyzable silane compound;

- c) extruding a) and b) into a tubular preform at a temperature wherein a) and b) react;
- d) forming said tubular preform into a balloon preform;
- e) blowing said balloon preform into a balloon; and
- f) exposing said balloon or balloon preform to water;

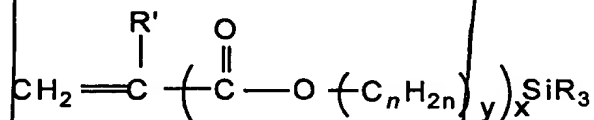
wherein said a) and b) react to form a polymeric material having hydrolyzable groups on said silane wherein said hydrolyzable groups crosslink upon exposure to water and form --Si--O--Si-- linkages..

21. The method of Claim 20 wherein said at least one organofunctional hydrolyzable silane has the following general structure:



where X is a monovalent non-hydrolyzable organic moiety comprising at least one functional group W which is reactive with said polymeric material with the proviso that an Si-C bond is present between Si and W; Y is a hydrolyzable group, Z is a monovalent hydrocarbon group, and m is an integer from 1 to 3.

22. The method of Claim 20 wherein said at least one hydrolyzable silane has the following general structure:



where R' is a hydrogen atom or lower C<sub>1</sub> to C<sub>4</sub> alkyl; x and y are 0 or 1 with the proviso that when x is 1, y is 1; n is an integer from 1 to 12 inclusive, preferably 1 to 4, and each R independently is a hydrolyzable organic group such as an

alkoxy group having from 1 to 12 carbon atoms, aryloxy group, araloxy group, aliphatic acyloxy group having from 1 to 12 carbon atoms, amino or substituted amino groups, or a lower alkyl group having 1 to 6 carbon atoms inclusive, with the proviso that not more than one of the three R groups is an alkyl.

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23. The method of Claim 22 wherein said hydrolyzable silane is selected from vinyltrimethoxysilane, vinyltriethoxysilane, allyltrimethoxysilane, and  $\gamma$ -(meth)acryloxypropyltrimethoxysilane.

10 24. The method of Claim 21 wherein W is selected from (meth)acrylamido, (meth)acryloxy, carboxyl, epoxy, amino, ureido, isocyanato, thiocyanato, mercapto, styryl, vinyl, allyl, haloalkyl, acid anhydride, sulfonyl azide, carboxylic acid esters of aromatic alcohols, and mixtures thereof.

15 25. The method of Claim 21 wherein X is selected from epoxycyclohexyl, glycidoxypropyl, isocyanatopropyl, vinyl, and allyl.

26. The method of Claim 21 wherein Y is alkoxy of C<sub>1</sub> to C<sub>4</sub>.

20 27. The method of Claim 21 wherein said hydrolyzable silane is selected from isocyanatopropyltriethoxysilane, glycidoxypropyltrimethoxysilane and 2-(3,4-epoxycyclohexyl)ethyltrimethoxysilane.

28. The method of Claim 20 wherein said polymeric material is amino functional.

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29. The method of Claim 20 wherein said exposure to water is accomplished in a water bath.

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30. The method of Claim 20 wherein in during said blowing step, said balloon is further axially stretched.

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